# NAI Focus Group

NASA ASTROBIOLOGY INSTITUTE

## NASA Astrobiology Institute Introduction

*NAI is a "virtual collaboratory" distributed across the United States and bound together through advanced telecommunications and electronic networking. The institute represents a partnership between NASA, universities, and research organizations to promote conduct, and lead integrated multidisciplinary research, to train young scientists, and to provide public access to the adventure of studying the living universe.*

## Focus Groups Introduction

*Focus Groups are research and planning teams formed around topics relevant to specific NAI goals and objectives. Established based on proposals submitted to NAI, Focus Groups contribute to astrobiology space missions and extend long-distance collaborations through the innovative use of networking and other technologies.*

## Astromaterials Focus Group

Like the other planets in our solar system, Earth is under continual bombardment by interplanetary matter. Most of this extraterrestrial debris burns up in the atmosphere, but some survives all the way to the ground. Along with samples brought back to Earth by space missions, these lunar rocks, meteorites, interplanetary dust particles, and any sample returned to Earth by a space mission are known generally as astromaterials.

To astrobiologists, astromaterials are useful for what they can tell us about the geochemistry of extraterrestrial environments that may also hold evidence of life beyond Earth. The study of astromaterials can provide fundamental information such as what organic compounds may have been available, their relative abundance, and distribution in the solar system. In March 2001, the Astromaterials Focus Group was formed to promote the study of astromaterial samples currently available, with an emphasis on Mars meteorites.

## Looking for Answers in Alien Rocks

Researchers today have access to several kilograms of rocks, which are believed to have originated from Mars. These samples, which arrived in the form of meteorites, constitute a priceless resource for the search for life in the solar system. While they have been studied extensively, these meteorites still contain information that has yet to be extracted.

During their residency on Earth, all of the Martian meteorites have accumulated terrestrial organic contaminants. However, at least two have been shown unequivocally to contain extraterrestrial organic compounds. One interpretation of these findings is that the organic compounds came from other meteorite impacts on Mars, before the Mars rocks found their way to Earth. Alternatively, another theory holds that the organic materials in the Martian meteorites may have been native to Mars and, thus, may contain invaluable information

*This 4.5 billion-year old rock, labeled meteorite ALH84001, is believed to have once been a part of Mars and to contain fossil evidence that primitive life may have existed on Mars more than 3.6 billion years ago.*

on the chemistry and potentially the history, of life on Mars. Both theories are important in that they may provide valuable information on prebiotic chemistry in the solar system and on Mars.

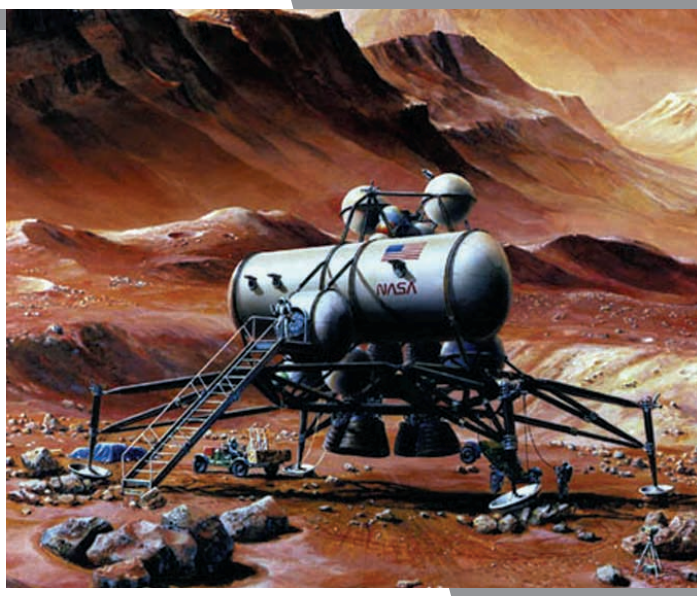
Other aspects of the Martian meteorites currently in hand remain insufficiently studied. At least three of the meteorites contain evidence, in the form of mineral deposits, for the onetime existence of water on Mars. These and other minerals in the rocks contain important information on the Martian environment and its variation over time. If Mars had an environment favorable to life and yet no life developed, it would be important to determine why.

The possible existence of microfossils in several of the Martian meteorites remains unresolved due to a lack of data. Additional research needs to be performed on the available samples to determine if Martian meteorites do indeed contain evidence for fossil life and to develop procedures for processing samples returned to Earth by space missions. Through its research the Astromaterials Focus Group will study the materials that can provide basic information on prebiotic chemistry and the compounds that may have been available before life began.

## Focus Group Activities

The NAI Astromaterials Focus Group, chaired by Dr. David McKay of NASA Johnson Space Center, consists of researchers interested in sample analysis

*This artist's rendering illustrates a Mars Sample Return mission under study at Jet Propulsion Laboratory and the NASA Johnson Space Center. The image depicts a rover consisting of three two-wheeled cabs, that is fitted with a stereo camera vision system and tool-equipped arms for sample collection.*




*Artist John J. Olson's conception for the future of space exploration. The Astromaterials group will try to understand the existing data on meteorites and to provide data required for future Mars missions.*

or in situ robotic measurements on Mars for the purpose of analyzing rocks and soils and detecting past or extant life. The group's initial focus is on understanding existing Martian meteorite data. They will also address new data acquisition methods, assess data requirements for future Mars sample collection, and generally support and promote the acquisition of Mars meteorite data.

In addition, the Focus Group will serve as a central repository for data, concepts, and new developments, and support planning for future Mars in situ analysis and sample return missions. The group plans to make informed recommendations on space missions, instruments, sample selection, contamination concerns, and other issues related to the study of life in the universe. Specific activities include a workshop addressing the evidence for and implications of biogenic magnetite in one of the Mars meteorites, and formally soliciting opinions from across NAI on approaches to the handling and processing of materials collected by a Mars sample return mission.

## NASA Priorities

The activities of the Astromaterials Focus Group address NASA space exploration priorities and support planning for upcoming missions. They also address the goals detailed in the Astrobiology Roadmap:

- Sources of Organics on Earth
- Linking Planetary & Biological Evolution
- Microbial Ecology
- Extremes of Life